



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/811,124	03/25/2004	Edgardo R. Hortaleza	TI-36905	9212
23494	7590	08/11/2005	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED P O BOX 655474, M/S 3999 DALLAS, TX 75265			ANDUJAR, LEONARDO	
			ART UNIT	PAPER NUMBER
			2826	

DATE MAILED: 08/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/811,124

Applicant(s)

HORTALEZA ET AL.

Examiner

Leonardo Andújar

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 June 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Claim 10 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
2. Claim 10 recites the limitation "to said plug" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-11 and 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant admitted prior art (APA) in view of Hsue et al. (US 5,734,200).
5. Regarding claim 1, APA (e.g. fig. 1) shows an integrated circuit having copper interconnecting metallization 102 protected by a first overcoat layer 104, portions of the metallization exposed in a window opened through the thickness of the first overcoat layer, comprising: a patterned conductive barrier layer 103b positioned on the exposed portion of the copper metallization and on portions of the first overcoat layer surrounding the window and a bondable metal layer 120 positioned on the barrier layer, the thickness of the bondable layer suitable for wire bonding. APA does not show a second

overcoat layer surrounding the window so that the surface of the second overcoat layer at the edge of the window is at or above the surface of the bondable layer. Nevertheless, Hsue (e.g. fig. 4) shows an integrated circuit having a second overcoat layer 60 at the edge of a window that is at or above a surface of a bondable layer 58 of a thickness of the bondable layer suitable for wire bonding. According to Hsue, this type embodiment provides an improved terminal bonding pad, which is particularly adapted for use of an Al wire. It prevents terminal failure that frequently occurs at the thermal cycling such as a terminal bonding pad separation from the support surface, or at the interfocus of various metal layers (col. 1/lis. 39-45 & col. 2/lis. 29-34). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include, in the copper interconnecting metallization disclosed by APA, a second overcoat layer surrounding the window so that the surface of the second overcoat layer at the edge of the window is at or above the surface of the bondable layer in accordance to Hsue's invention in order to prevent terminal failure that frequently occurs at the thermal cycling such as a terminal bonding pad separation from the support surface, or at the interfocus of various metal layers.

6. Regarding claim 2, APA teaches that the first overcoat thickness is from about 0.5 to 1.0 micrometers (see page 7/lis. 17-18).

7. Regarding claim 3, APA teaches that the first overcoat comprises one layer of silicon nitride (see page 7/lis. 17-18).

8. Regarding claim 4 and 5, APA teaches that the barrier layer comprise tantalum nitride (page 7/ll. 15) whereas Hsue teaches that the barrier layer 52 can be made of titanium-tungsten/titanium (col. 4/lls. 35-41).

9. Regarding claim 6, APA teaches that the barrier layer has a thickness between 0.01 and 0.03 micrometers (page 7/lls. 15-16).

10. Regarding claims 7-9, APA teaches the bondable metal is aluminum or an aluminum alloy having a thickness suitable for wire bonding (i.e. between about 0.7 –1.0 micrometers; page 7/lls. 26-29).

11. Regarding claim 10 (as understood), Hsue shows a ball bond attached to the bondable material. Note that the wire 62 is attached to the bondable material by a ball bond.

12. Regarding claim 11, APA in view of Hsue does not teach that barrier and bondable metal layers overlap between about 0.1 and 0.3 micrometers over the surrounding portions of the first overcoat layer. Nevertheless size differences will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such size is critical. "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the workable ranges by routine experimentation". In re Aller, 220 F.2d 454,456,105 USPQ 233, 235 (CCPA 1955). Since the applicant has not established the criticality (see next paragraph) of the claimed dimension, it would have been obvious to one of ordinary skill in the art to use these values in the device disclosed by APA in view of Hsue.

CRITICALITY

The specification contains no disclosure of either the critical nature of the claimed plasma exposure time or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

13. Regarding claim 13, Hsue disclosed that the second overcoat has a thickness between about 1 and 2 micrometers (col. 4/lis. 53-54).

14. Regarding claim 14, Hsue teaches a distance separating the edge of the second overcoat and the edge of the combined barrier and bondable metal layers. Note that both edges are separated.

15. Regarding claim 15, APA in view of Hsue shows that the distance correspond to the distance of the overlapping between the barrier/bondable metal layers 56/58 and the surrounding portions of the first overcoat layer 54. APA in view of Hsue does not disclose that the distance about 3 and 6 micrometers Nevertheless size differences will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such size is critical. "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the workable ranges by routine experimentation". In re Aller, 220 F.2d 454,456,105 USPQ 233, 235 (CCPA 1955). Since the applicant has not established the criticality (see paragraph above) of the claimed dimension, it would have been obvious to one of ordinary skill in the art to use these values in the device disclosed by APA in view of Hsue.

Art Unit: 2826

16. Claims 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant admitted prior art (APA) in view of Hsue et al. (US 5,734,200) further in view of Liu et al. (US 6,251,694).

17. Regarding claim 12, APA in view of Hsue shows most aspects of the instant invention including a second overcoat (i.e. passivation layer) comprising PSG (col. 4/lis. 51-53). APA in view of Hsue does not teach that the second overcoat layer is an organic material selected from a group consisting of polyimide, benzocyclobutene, and related polymeric compounds. Nevertheless, Liu disclose that PSG and polyimide are suitable materials for overcoat or passivation layers (col. 3/lis. 22-26). It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the second overcoat disclosed by APA in view of Hsue of polyimide as taught by Lius, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416

18. Claims 16-18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsue et al. (US 5,734,200) in view of further in view of Liu et al. (US 6,251,694) further in view of Sabin (US 6,737,745).

19. Regarding claims 16 and 20, Hsue (e.g. fig. 4) teaches a wafer-level method of fabricating a metal structure for a contact pad 46 (e.g. polysilicon; col. 4/ll. 24) of an integrated circuit having an interconnecting protected by a first overcoat 54 layer including insulating silicon compounds (col. 4/ll. 33), comprising the steps opening a window through the thickness of the first overcoat layer to expose portions of the

interconnection layer (e.g. photo lithography & etching; col. 4/lis 54-58); depositing a barrier metal layer 56 over the wafer to cover the exposed copper metallization and first overcoat surface; depositing a bondable metal layer 58 over the barrier layer in a thickness sufficient to fill the overcoat window and to enable wire ball bonding; patterning both the deposited metal layers so that only the layer portions inside the window and over a first overcoat area close to the window perimeter remain (e.g. photo lithography & etching; col. 4/lis 54-58); depositing a second overcoat layer 60 (e.g. PSG) over the wafer so that the surface of the second overcoat at the edge of the window is at or above the surface of the bondable layer; and selectively removing the second overcoat layer from the bondable metal layer to expose the bondable metal for the process of wire bonding (e.g. photo lithography & etching; col. 4/lis 54-58). Hsue does not teach that the pad is made of copper pad and that second overcoat layer is made of an organic and light-sensitive material. Nevertheless, Sabin teaches that polysilicon and copper are suitable material for bonding pad (col. 3/lis. 59-63) whereas Liu disclose that PSG and polyimide (organic and light-sensitive material) are suitable materials for overcoat or passivation layers (col. 3/lis. 22-26). It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the pad disclosed Hsue of copper and the second overcoat disclosed by Hsue in view of Sabin of polyimide as taught by Liu, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

Art Unit: 2826

20. Regarding claim 17, Hsue teaches that the step of selectively removing the second overcoat layer comprises the steps of: selectively photo-exposing the second overcoat layer over the contact pads, applying the depth of focus; and removing the photo-exposed portions of the second overcoat layer to expose the bondable metal (e.g. photo lithography & etching; col. 4/lis 54-58).

21. Regarding claim 18, Hsue shows that depth of focus is applied to create a distance, which separate the edge of the remaining second overcoat from the edge of said bondable metal.

22. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hsue et al. (US 5,734,200) in view of further in view of Liu et al. (US 6,251,694) further in view of Sabin (US 6,737,745) further in view of Perry (US2003/00301153).

23. Regarding claim 19, Hsue in view of Liu shows most aspects of the instant invention except for the use of a spin on process for depositing a second overcoat. Nevertheless, Perry (e.g. fig. 21) shows an overcoat layer 34 deposited by spin coating (0033). It would have been obvious to one having ordinary skill in the art at the time the invention was made to deposit the second overcoat layer disclosed by Hsue in view of Liu further in view of Sabin using an spin coating process as taught by Perry since spin coating provide a controllable uniform thickness and can be conducted for a short time at a low cost.

Conclusion

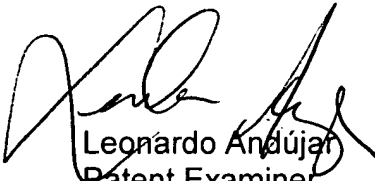
24. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leonardo Andújar whose telephone number is 571-272-

Art Unit: 2826

1912. The examiner can normally be reached on Mon through Thu from 9:00 AM to 7:30 PM EST.

25. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J. Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

26. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Leonardo Andujar
Patent Examiner
Art Unit 2826
08/05/2005